Lagoon

Mechanical fine screen (ROTOMAT) headworks facility

Wetland cell

Effluent from wetland cells

| Crowley County Correctional Facility Statistics | |
|---|---|
| **Nearest Town:** | **Olney Springs** |
| **County:** | **Crowley** |
| **River Basin:** | **Lower Arkansas** |
| **Receiving Water Body:** | **Arkansas River** |
| **Year Online:** | **1998** |
| **Population:** | **600 inmates** |
| **Elevation (feet):** | **4354** |
| **Design Flow (mgd):** | **0.150** |
| **Average Flow (mgd):** | **0.110** |
| **Size (acres):** | **3.3** |

## Facility Description

This facility is a minor municipal lagoon system. The facility consists of a mechanical fine screen (ROTOMAT) headworks facility, two aerated lagoons, a polishing pond, two constructed wetlands, and a

chlorine contact chamber. The influent flow is measured by a continuous recorder and totalizer. The effluent flow is measured by a continuous recorder and totalizer.

### Lagoons

The Crowley Correctional Facility lagoon system consists of 2 aerated cells, and one polishing pond. Some of the lagoon system features are detailed in the table below.

| Lagoon Information | | | |
|---|---|---|---|
| **Cell No.:** | **1** | **2** | **3** |
| **Surface Area (sq. ft.)** | **36,875** | **36,875** | **10,625** |
| **Avg. Depth (ft)** | **10** | **10** | **10** |
| **Avg. Volume (Million gallons)** | **1.9** | **1.9** | **0.4** |
| **Detention time (days)** | **12.6** | **12.6** | **2.7** |
| **Aerator size (hp)** | **60** | **15** | **NA** |

## Background Information

The wetland system is an original component of this wastewater treatment facility. It was modeled after the successful lagoon-wetland system used at the nearby Town of Crowley.

## Energy Analysis

Utility bills for this system run approximately $1000 per month. Energy at this site is used primarily on the lagoon aerators and the rotomat.

## Wetland Design

### Design Methods

This system was modeled after the Town of Crowley wetland system. Sizing requirements were determined by using CDPHE standards of 10-50 acres per mgd of influent. The surface loading for this system is 22 acres / mgd

### Objectives

The wetlands are intended to polish the lagoon effluent. The removal of TSS is the primary design goal.

### Size

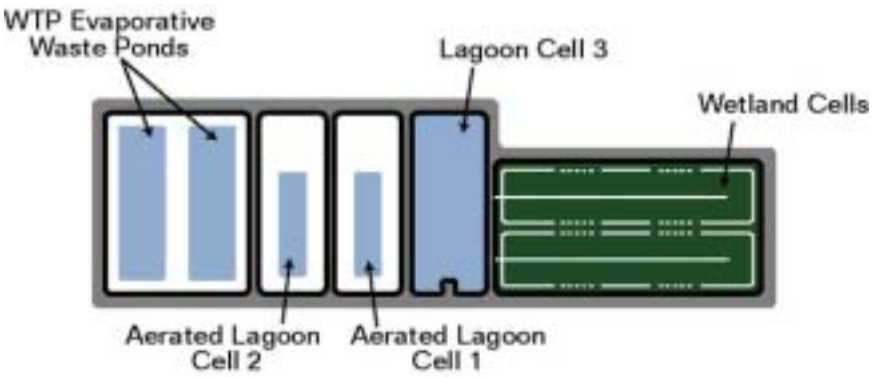
The wetland system is comprised of four surface flow cells. Each wetland cell is 600’long by 60’ wide.

### Shape

The rectangular wetland cells have aspect ratios of 10:1. The flow path is serpentine to minimize short-circuiting and maximize the aspect ratio.

## Hydraulics

This system is a surface flow wetland. Water in wetlands is running at a depth of about 3". The flow follows a serpentine pattern. The hydraulic residence time in the system is 7.2 days, with a volume of 1.08 million gallons. A buried 30 mil PVC liner eliminates groundwater influences.



## Treatment Goals

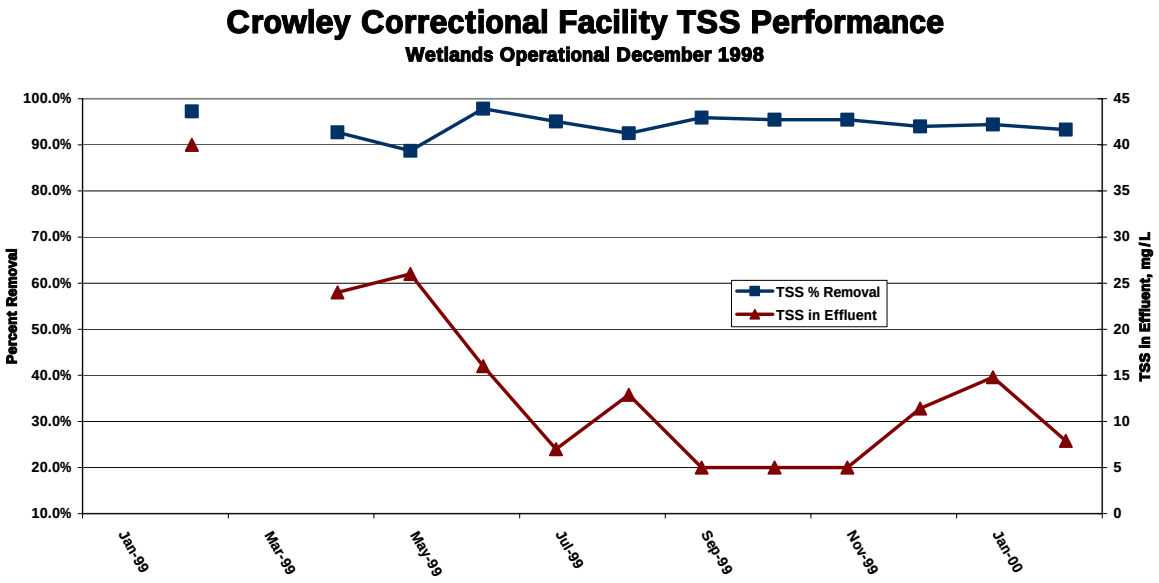
| Permitted Discharge Limitations | |
|---|---|
| **Oil and Grease:** | **10 mg/l (Daily Max)** |
| **$BOD_5$:** | **30 mg/l (30-day ave)** |
| **$BOD_5$ Removal:** | **85%** |
| **TSS:** | **75 mg/l (30-day ave)** |
| **PH, su (min – max)** | **6.0 – 9.0 (Daily Max)** |
| **Chlorine Residual:** | **0.5 mg/l (Daily Max)** |
| **Fecal Coliform Bacteria:** | **6,000 organisms per 100 ml (Daily Max)** |

## Water Quality Data

The Discharge Monitoring Report (DMR) forms documented numerous exceedances of the hydraulic and organic capacities. In part, this was a result of the mass loading not being calculated correctly. Reported TSS influent values are higher than what is normally seen at this type of facility. This may be due to sampling procedures.

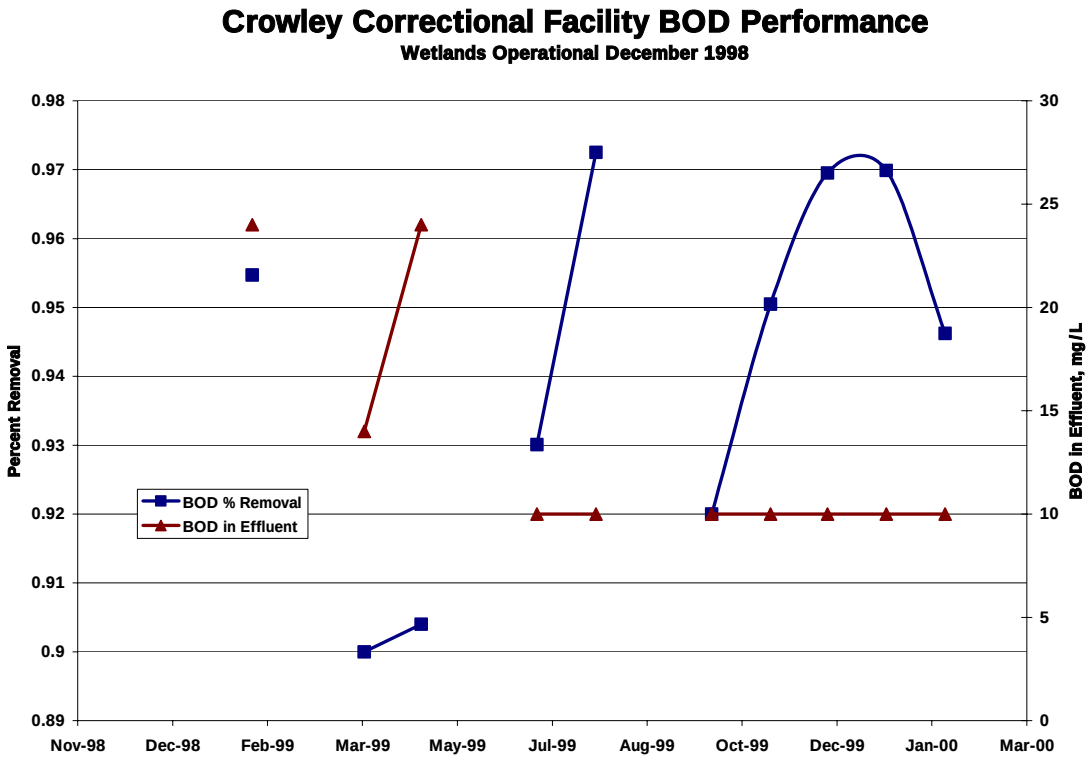
### TSS Data

Some general observations can be made by reviewing the plotted 30-day average TSS data. The TSS graph plots the percent removal on the left axis and TSS in mg/l in the effluent on the right axis. In the months before the wetland was implemented, there was no discharge from the treatment facility. Since no discharge was occurring, data for this period were not reported. Trends in the TSS data indicate that TSS in the effluent has consistently been below permit limitations. Average influent TSS is 333 mg/l and average effluent is 15 mg/l.



## BOD Data

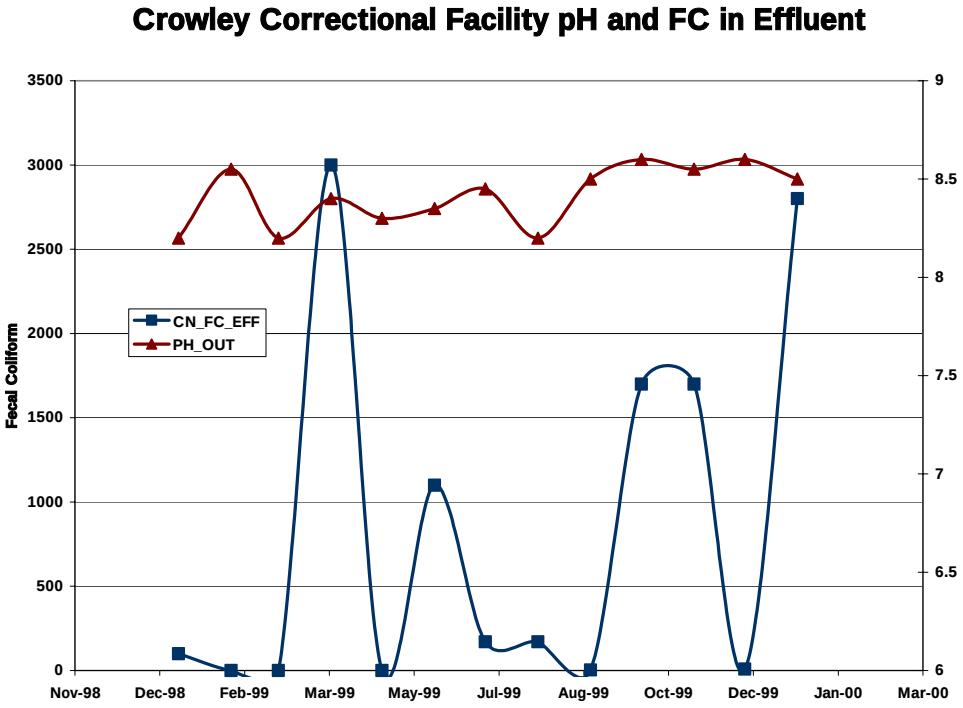
The BOD data is plotted similarly to the TSS data, with mg/l in the effluent on the right axis, and percent removal on the left axis. The average monthly BOD in the influent is 278 mg/l and the average monthly effluent is 13 mg/l.




## pH and Fecal Coliform

Data for these two categories have been plotted on the same graph. Data reflect the quality of the effluent; no influent measurements are taken for these parameters. The pH values plotted are an average of the minimum and maximum 30-day values that are reported in the monthly reports. The average monthly pH value is 8.42 , consistently stayed within the allowable range of 6.5 to 9.

The average monthly fecal coliforms in the effluent are 1075. This meets the discharge permit requirements.




## General Ecological Setting

The Crowley County Correctional Facility constructed wetlands consist of two flat, rectangular basins, approximately 2.75 acres each, which discharge into the Arkansas River. The wetlands are approximately 96 percent vegetated and 4 percent water. This wetland is located on the prison grounds in a former agricultural field. The site is located a considerable distance from any creek or other wetland.

## Cell Vegetation

The two wetland cells support identical wetland vegetation. Cattail (*Typha latifolia* and *Typha angustifolia*) dominate, and reed canarygrass (*Phalaris arundinacea*), duckweed (*Lemna minor*), and creeping spikerush (*Eleocharis palustris*) compose the remaining 10 percent of the wetland vegetation.

### Planting/Seeding

Small cattail plugs were planted in the wetland cells on approximate 3 to 4 foot spacing in the spring of 1998.

### Weeds

No noxious weeds were found on the project site.

## Wildlife

The wetlands provide habitat for a variety of song and shore birds. Killdeer and swallow were observed during the site visit, and red winged blackbirds potentially use the site. The site contains some vegetative

structural diversity, which is mainly a result of small pockets of shallow water among cattail stands. This habitat is unique on the landscape because there are no other wetlands or ponds in the vicinity. The treatment wetlands provide habitat for waterfowl, songbirds, and probably muskrats.

## Wetland Biodiversity Functional Assessment

General wildlife habitat and uniqueness rated moderate for this wetland. Sediment/toxicant/nutrient removal was rated high. All other functions of the wetland rated low. The wetland received 33 percent of the possible functional points, and falls into Category IV, the lowest functional category.

**Wetland Biodiversity Functional Assessment.**

| Function and Value Variables | Functional Points (0.1 to 1) | Possible Points |
|---|---|---|
| General Wildlife Habitat | 0.4 (mod.) | 1 |
| General Fish/Aquatic Habitat | 0.0 | 1 |
| Production Export/Food Chain Support | 0.3 (low) | 1 |
| Habitat Diversity | 0.1 (low) | 1 |
| Uniqueness | 0.2 (low) | 1 |
| Total Points | 2.0 (40%) | 5 |
| Wetland Category (I, II, III, or IV) | IV | |

## Human Use

The wastewater wetland is part of a restricted public access area, but it is used as part of a program to train inmates in the operations of wastewater facilities. Opportunities such as this could prove to be quite valuable to the prison system and to inmates following their release.

## Maintenance Issues

The only maintenance issue noted is the need to thoroughly remove non-organic waste from the prison wastewater before it enters the lagoon and wetland system. The wetland system is burned every winter.

## Overall Site Comments

This wetland is functioning as intended in the treatment of wastewater. It also supports a healthy stand of vegetation.